

# 2007 RESEARCH PROBLEM STATEMENT

**Problem Title:** Design Methodology for Repair of Prestressed Concrete Girder Ends with FRP Composites

**No.:** 07.08-5

**Submitted By:** Chris Pantelides

**Email:** chris@civil.utah.edu

**Project Champion:** Richard Miller, David Eixenberger

(UDOT or FHWA employee who needs this research done, will help the Research Division lead this project, and will spearhead the implementation of the results. If the project gets prioritized at the UTRAC conference, a Champion Commitment Form will be required before funding.)

**1. Briefly describe the problem to be addressed.**

The methodology will identify the issues involved with corrosion of prestressed concrete girder ends and any possible loss of shear strength and develop repair methods.

**2. Strategic Goal:** ☒ Preservation ☐ Operation ☒ Capacity ☒ Safety (check all that apply)

**3A. List the research objective(s) to be accomplished:**

1. Procedures involving cleaning and removal of loose concrete and injection of possible cracks will be identified.
2. The design, selection and application of Fiber Reinforced Polymer (FRP) composites will be developed for shear strengthening of the ends of prestressed concrete girders.
3. Recommendations for coating the FRP composite jackets and sealing the structural system to stop water penetration will be developed.

**3B. List the major tasks to accomplish the research objective(s):**

**Estimated person-hours:**

1. Literature Review.
2. Synthesize steps from other research to develop effective surface preparation and crack injection procedures.
3. Develop the design of FRP composite for shear strengthening of prestressed concrete girder ends with corrosion, and the selection and application of suitable FRP composite systems.
4. Identify coating systems for long-term durability of FRP composite retrofit and techniques for sealing the structural system and preventing water penetration.
5. If there is uncertainty regarding stress losses in the tendons due to deterioration, a recommendation will be developed for applying external FRP composite reinforcement to compensate and restore the ultimate moment capacity.

**4. Estimate the cost of this research study including implementation effort (use person-hours from No. 3B):** \$60,000

**5. Indicate type of research and/or development project this is**

Large: ☒ Research Project ☐ Development Project  
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative  
☐ Other: \_\_\_\_\_

(A small project is usually less than \$20,000 and shorter than 6 months)

**6. Outline the proposed schedule (when do you need this done, and how will we get there):**

April 2007-April 2008

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**7. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?**  
University

**8A. What deliverables would you like to receive at the end of this project?** (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

Design Method, Technique, Report, Manual of Practice.

**8B. Describe how this project will be implemented at UDOT.**

Once a design methodology and a manual of practice are developed, trained professionals could perform the repairs to existing concrete prestressed girders.

**8C. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.**

The life of existing prestressed concrete girders will be extended an additional 15 to 20 years, allowing for a more gradual replacement schedule of existing older bridges.

**9. Describe the expected risks and obstacles as well as the strategies to overcome them.**

9. Two risks are involved: (1) Specifying wrong FRP composite materials, and (b) overdoing the water-jet process. The manual to be developed will identify and suggest methods to mitigate these risks.

**10A. List other people (UDOT and non-UDOT) who are willing to participate in the Technical Advisory Committee (TAC) for this study:**

<u>Name</u>	<u>Organization / Division / Region</u>	<u>Phone</u>	<u>Email</u>
Larry Reaveley	University of Utah		
Richard Miller	UDOT Structures		
David Eixenberger	UDOT Research		
Daniel Hsiao	UDOT Research		

**10B. Identify other Utah, regional, or national agencies and other groups that may have an interest in supporting this study:**

Other neighboring States as well as FHWA should desire the outcome of this study.